

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File

FROM: Izabel Hartman

DATE: August 8, 2012

SUBJECT: Drinking Water Revolving Fund Project No. 7374-01
City of Grand Rapids (SE Tank WM; East Paris Service Center Expansion)
Green Project Reserve (GPR) Funding Cost Calculation

The purpose of this memo is to document the cost calculations for the green reserve funding for the City of Grand Rapids, DWRF Project No. 7374-01. The total loan amount is \$4,380,000. The portion of the project that qualifies as green is the Variable Frequency Drive and premium efficiency pump and motor installation (\$874,155) at the East Paris Service Center, and the construction of the Southeast Tank Water Main (\$345,105.51). Therefore, the total cost of construction for the green portion of the project is \$1,219,260.51. The total construction cost for the entire DWRF project is \$3,223,347.51. In order to determine the percentage of non-construction costs associated with the green portion of the project, a proration was applied, as shown below:

$$1,219,260.51 / 3,223,347.51 = 0.38$$

$$4,380,000 \times 0.38 = 1,664,400$$

The total amount of green reserve funding for this project comes to \$1,664,400.

The principal forgiveness amount is 50% of GPR associated costs.

$$1,664,400 \times 50\% = 832,200$$

The total amount of principal forgiveness for this project comes to \$832,200.

Building and Pumping Improvements
to the EAST PARIS SERVICE CENTER

Sheet 2 of 9

T:\Bid Docs\11043 Bidtab.xlsx

ITEM					
NO.	ITEM	UNIT	QUAN	UNIT PRICE	TOTAL
1	Building and Pumping Improvements to the EAST PARIS SERVICE CENTER	Lump Sum	1	\$2,104,987.00	\$2,104,987.00
2	Furnishing and Installation of the following Green Project Reserve Items: Pump No. 3 and Pump No. 4 (pumps and motors); Motors for Pump No. 1 and Pump No. 2; four new VFDs; new Motor Control Center; Electrical Supply to Pumps, VFDs, and MCC; and Instrumentation and Controls.	Lump Sum	1	\$712,255.00	\$712,255.00
3	Brick Repair (as described in Division 04 Section "Maintenance of Unit Masonry")	Sq Ft	200	\$50.00	\$10,000.00
4	CMU Repair (as described in Division 04 Section "Maintenance of Unit Masonry")	Sq Ft	400	\$25.00	\$10,000.00
5	Brick Repointing (as described in Division 04 Section "Maintenance of Unit Masonry")	Sq Ft	1,600	\$20.00	\$32,000.00
6	CMU Repointing (Interior) (as described in Division 04 Section "Maintenance of Unit Masonry")	Sq Ft	500	\$18.00	\$9,000.00
TOTAL:					\$2,878,242.00
Discount Percentage Points:			%		
Prosperous Economy (A)					
Social Equity (B)					
Prosperous Economy - Annual (C)					
Enriched Lives (D)					
Clean Environment (E)					
Total Discounts:					
Discount Amount (Dollars & Cents)					
DISCOUNTED BID TOTAL:					\$2,878,242.00

*see revised

NOTES:

- Square foot quantities for Items 3, 4, 5, and 6 are based on wall square foot, not size or length of joints to be repaired. The wall square foot area is further defined as the face area of the masonry wall measured from the crack being repaired to the nearest masonry joint on each side of the repaired crack or joint, as illustrated in Sketch A1-A1:
- Item No. 1, "Building and Pumping Improvements to the EAST PARIS SERVICE CENTER", is the lump sum total of all work not specifically described in Bid Items 2, 3, 4, 5, and 6.
- The total Bid Price is the sum of Items 1, 2, 3, 4, 5, and 6.

Hartman, Izabel (DEQ)**From:** Irving, Cynthia C. [ccirving@ftch.com]**Sent:** Tuesday, August 07, 2012 1:36 PM**To:** Hartman, Izabel (DEQ)**Cc:** Stam, Breese; Bratt, Dave**Subject:** RE: EPSC GPR

As shown in the table below, Items 1 and 2 are the only ones that are involved in the allocation. Items 3-6 do not change. The total bid amount does not change. At bid time when Davis received Parkway Electric's bid, the amount was not broken between the Base Bid and the GPR portion of the work. Davis divided Parkway's bid about 50/50 between Items 1 (\$336,100) and 2 (\$330,100). Following the bid, Davis got additional information from Parkway and it was determined that their bid should have been allocated between Items 1 (\$174,200) and 2 (\$492,000) at a 25/75 ratio. This requires \$161,900 being moved from Item 1 to Item 2 and yields a total GPR amount of \$874,155.

Bid Item No.	Description	Original Bid	GPR Correct Allocation
1	Base	\$2,104,987	\$1,943,087
2	GPR	\$712,255	\$874,155
3	Brick Repair	\$10,000	\$10,000
4	CMU Repair	\$10,000	\$10,000
5	Brick Repointing	\$32,000	\$32,000
6	CMU Repointing	\$9,000	\$9,000
	TOTAL	\$2,878,242	\$2,878,242

Hartman, Izabel (DEQ)

From: Irving, Cynthia C. [ccirving@ftch.com]
Sent: Wednesday, August 08, 2012 3:27 PM
To: Hartman, Izabel (DEQ)
Cc: Stam, Breese; Bratt, Dave
Subject: RE: EPSC GPR

The table below presents the detailed information from the contractor for the GPR portion of the East Paris Project.

Item	Cost
Pump No. 3 and Pump No. 4 (pumps and motors)	\$245,070
Motors for Pump No. 1 and Pump No. 2	\$76,180
Installation of Pumps (3&4) and Motors (1&2)	\$60,905
Four New VFD's	\$172,592
New Motor Control Center	\$127,190
Electrical Supply to Pumps, VFD's and MCC	\$27,675
Instrumentation and Controls	\$164,543
Total	\$874,155

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ITEM					
NO.	ITEM	UNIT	QUAN	UNIT PRICE	TOTAL
1	Mobilization, Max. \$15,000	Lump Sum	1	15,000 -	15,000 -
2	Temporary Gravel Pavement	Ton	50	22 -	1,100 -
3	Temporary HMA Pavement	Ton	5	100 -	500 -
4	Remove Tree, 8 - 18 inch	Each	2	195 -	390 -
5	Remove and Salvage 16 Inch Plug	Each	2	155 -	310 -
6	6 Inch Water Main	Lin Ft	16	60 -	960 -
7	12 Inch Water Main	Lin Ft	10	137 -	1,370 -
8	16 Inch Water Main	Lin Ft	1,707	106 -	180,942 -
9	6 Inch 90 Degree Bend	Each	1	380 -	380 -
10	16 Inch 45 Degree Bend	Each	4	1,300 -	5,200 -
11	16 Inch x 16 Inch x 6 Inch Tee	Each	1	1,475 -	1,475 -
12	16 Inch x 16 Inch Four-Way Cross	Each	2	3,280 -	6,560 -
13	16 Inch x 12 Inch Reducer	Each	1	1,160 -	1,160 -
14	16 Inch x 6 Inch Reducer	Each	1	1,065 -	1,065 -
15	6 Inch Valve and Box	Each	1	930 -	930 -
16	16 Inch Butterfly Valve and Box	Each	6	3,065 -	18,390 -
17	12 Inch Sleeve	Each	1	730 -	730 -
18	16 Inch Sleeve	Each	4	1,750 -	7,000 -
19	16 Inch Plug	Each	1	975 -	975 -
20	Air Vent Manhole	Each	1	3,525 -	3,525 -
21	Blow-Off Assembly	Each	1	8,050 -	8,050 -
22	Contractor Assistance for Live Tap of 36 inch Concrete Water Main	Lump Sum	1	11,000 -	11,000 -
23	5 Inch Hydrant	Each	2	2,065 -	4,130 -
24	Remove and Replace Lights, Landscaping and Sign (3511 Patterson Ave.)	Lump Sum	1	270 -	270 -
25	Remove and Replace Sign (3533 Patterson Ave.)	Lump Sum	1	135 -	135 -
26	Private Lawn Sprinkling Sytems, Identify, Protect and Restore	Lump Sum	1	1,000 -	1,000 -
27	Maintain Traffic (Estimated 76 Days)	Lump Sum	1	32,595 -	32,595 -
28	Dust Control	Lump Sum	1	1,050 -	1,050 -
29	Restoration of Surface Type I - 36th St	Lin Ft	47	215 -	10,105 -
30	Restoration of Surface Type I - Patterson Ave	Lin Ft	42	250 -	10,500 -
31	Restoration of Surface Type VI	Lin Ft	1,620	502 -	8,100 -
32	Subgrade Undercutting	Cu Yd	400	100 -	40,000 -
33	Soil Erosion and Sedimentation Control	Lump Sum	1	3,140 -	3,140 -
34	Stormwater Operator's Inspections	Each	50	25 -	1,250 -
35	Protect Catch Basin	Each	9	100 -	900 -
36	Disposal of Contaminated Soil	Ton	50	1 -	50 -
37	Hydrant Extension	Lin Ft	20	1 -	20 -
38	Fence, Temporary, Modified	Lin Ft	400	2 -	800 -
TOTAL:					341,457 -
Discount Percentage Points:			%		
Prosperous Economy (A)					
Social Equity (B)					
Prosperous Economy - Annual (C)					
Enriched Lives (D)					
Clean Environment (E)					
Total Discounts:			0		
Discount Amount (Dollars & Cents)					0
DISCOUNTED BID TOTAL:					341,457 -

TYPE OF CONTRACT: Reconstruction

APPROVED BY CONSULTANT: N/A DATE: _____

APPROVED BY CONTRACTOR: [Signature] DATE: 7/13/12

AUTHORIZED BY CITY ENGINEER: Mark DeLeon DATE: 7/12/12

Prepared/Reviewed By: [Signature] Approved By: [Signature] Distributed on: 7/19/12

T:/11028/Change Order/C.O. #1

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Izabel Hartman, Environmental Quality Analyst
Revolving Loan Section, Resource Management Division

FROM: Michael Bolf, P.E.
Field Operations Section, Resource Management Division
Grand Rapids District Office

DATE: May 8, 2012

SUBJECT: City of Grand Rapids - Project No. 7374-01
Qualification for Green Project Reserve Funding - **REVISED**

The purpose of this memo is to confirm the basis for determining portions of the city of Grand Rapids DWRP Project No. 7374-01 that qualify for the green project reserve funding under Public Law 111-88. The portions of the project that the city is applying for GPR funding consist of the installation of variable frequency drives (VFDs) at the East Paris Service Center (EPSC), installation of premium efficiency pumps, and the construction of a transmission main to the proposed SE elevated tank in the SE High Pressure District. The city's consultant has submitted an April 5, 2012 letter outlining the energy savings that could be realized through the implementation of these improvements.

Based on the information provided by the city's consultant, these projects do qualify for green project reserve funding.

- a) Without proper control, pressure fluctuations on the discharge side of the EPSC constant speed pumps are greater than desirable. To control pressure fluctuations, an existing bleeder valve is used to continuously allow high pressure surges to "bleed" back to the suction side of the pumps. This practice is very inefficient as all of the water that bleeds back will need to be re-pumped. The installation of VFDs on the EPSC pumps will eliminate the current practice of bleeding water back from the high pressure to the East Paris Ground Storage Tank, thereby eliminating the additional energy demand needed to re-pump that water. While operation of the pumps using a VFD may reduce energy use in itself, it is the energy savings made possible by being able to operate the pumps without using the bleeder valve that should qualify this project for green reserve funding.
- b) The replacement of all four pumping units with premium efficiency motors (NEMA Premium Efficient Motors are categorically eligible) will result in less energy use at a given pumping rate compared to the existing pumping system.
- c) In order to fill the proposed SE Elevated tank, the city's hydraulic model indicates that either an additional pump would be required or transmission main improvements would be necessary. Therefore, the installation of the SE Tank water main effectively eliminates the need for additional pumping thereby reducing future energy use.

For these reasons, the aforementioned projects are eligible for green project reserve funds. The costs that qualify for green project reserve will be determined after bids are received and the amount of the loan established. At that point, the percentage of this loan that is provided by Public Law 111-88 can be applied to the total amount spent on this portion of the project to determine the green project reserve.

April 5, 2012
Project No. G110386

Ms. Izabel Hartman
Project Manager
RLS/Resource Management Division
Dept. of Environmental Quality
Constitution Hall - 3rd Floor South
525 West Allegan
Lansing, MI 48933

Re: Grand Rapids Drinking Water Revolving Fund (DWRP) Fiscal Year (FY) 2012
Green Project Reserve (GPR) Letter Update

Dear Ms. Hartman:

This letter is an update to our June 13, 2011 GPR letter. The GPR business cases for the East Paris Service Center (EPSC) expansion and the Southeast Tank Water Main were presented in our May 20, 2011 letter. This letter provides additional information and cost estimates for the EPSC expansion.

Motor Efficiency of Pumps

The four pumps (two new and two replacement) at the East Paris Service Center will be specified with NEMA Premium Efficiency Motors. The NEMA standard for an enclosed 350 horsepower (HP) premium efficiency motor is 95.8%. The existing motors, when new in 1979, were rated at an efficiency of 94%. Large motors have historically been efficient due to the large amount of copper in their windings. As discussed in our May 20, 2011, GPR letter, a 1.8% increase in efficiency on the 350 HP motor (assuming an increase in energy costs of 3% per year) yields a 20-year present worth cost of \$46,500. While the increase in efficiency is limited due to the historic selection of energy efficient equipment, the new motors will improve upon the existing pump efficiency.

VFD and Pump Cost Estimate

Our May 20, 2011 letter summarized the energy and cost savings realized by the EPSC Expansion. Installation of the new pumps and VFDs for all four pumps saved 163,000 kilowatt hours (KWh) of electricity annually, which is 8.4% of the total energy used currently at the EPSC. The energy savings is due primarily to the elimination of the bleed-back valve on the discharge side of the pumps. Instead of recirculating water, the VFDs can be used to operate the pumps at a lower speed and hence, lower pressure. Effective operation of the VFDs will require pressure data that will be tied into the Supervisory Control and Data Acquisition (SCADA) system for either automatic speed control or feedback to the operators who can control the pump speed settings. Flow monitoring, in addition to pressure readings, will provide the data needed to operate the pumps near their best efficiency point (BEP) and the data needed to monitor wear on the pumps to assist in operation and maintenance.

The May 24, 2011 e-mail requested that the GPR portion of the cost estimate in the Project Plan be provided, along with a payback calculation. Dividing out the GPR portion of the project was difficult due to the interrelated nature of the project. Table 1 presents the cost estimate presented in the Project Plan. Other than the Miscellaneous Building Improvements, all of the project elements are needed for proper installation and operation of the new pumps.

1515 Arboratum Dr., SE

Grand Rapids, MI

49546

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fax: 616.575.8155

www.fitch.com

Table 1 – Original EPSC Cost Estimate from DWRF Project Plan

	Estimated Capital Cost	Design Life (yrs)	Replacement Cost	Salvage Value
Building Expansion	\$800,000	50	\$0	\$480,000
Process Pipe and Valves	\$450,000	50	\$0	\$270,000
Site Work and Piping	\$100,000	50	\$0	\$60,000
Pumps and Motors	\$360,000	20	\$0	\$0
Variable Frequency Drives	\$200,000	20	\$0	\$0
Instrumentation	\$175,000	20	\$0	\$0
Electrical	\$450,000	20	\$0	\$0
Miscellaneous Building Improvements	\$150,000	50	\$0	\$90,000
Subtotal - Estimated Construction Cost	\$2,690,000		\$0	\$900,000
Contingency (20%)	\$540,000			
Engineering (20%)	\$540,000			
Total - Estimated Project Budget	\$3,770,000			

Therefore, the GPR portion of the project focused on the four VFDs, the four motors, the two new pumps, and those components most closely related to their installation and operation. Table 2 presents the more detailed GPR cost estimate. The project includes VFDs for all four pumps with a material cost of \$200,000 (four VFDs at \$50,000 each). The VFDs will be installed in a motor control center. The instrumentation is needed to properly operate the pumps including integration of the necessary pressure and flow data. The electrical is a critical component of the VFD and pump installation. The two new pumps have a material cost of \$180,000 (two pumps at \$90,000 each). The two motors for the replacement of the existing pumps have a material cost of \$80,000 (\$40,000 each). Installation of the two new pumps and all four motors is also included.

Table 2 – Green Project Portion for EPSC

	Estimated Capital Cost	Design Life (yrs)	Replacement Cost	Salvage Value
Motor Control Center with Four VFDs	\$310,000	20	\$0	\$0
Instrumentation	\$125,000	20	\$0	\$0
Electrical to Pumps and MCC	\$80,000	20	\$0	\$0
Pumps (Two New) and Motors (Two New, Two Replacement)	\$260,000	20	\$0	\$0
Installation of Pumps and Motors	\$75,000	20	\$0	\$0
Subtotal	\$850,000		\$0	\$0
Contingency	\$110,000			
Construction Engineering Cost	\$80,000			
Total Construction Cost	\$1,040,000			
Design Engineering	\$80,000			
Total Estimated Project Budget	\$1,120,000			

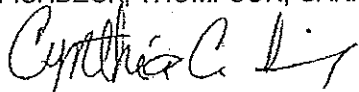
Ms. Izabel Hartman
Page 3
April 5, 2012

All of the components listed in Table 2 have a twenty-year design life. The twenty-year present worth analysis determined that the project would result in a \$262,000 savings. Evaluating a payback on capital and operation costs, the savings do not cover all of the costs listed in Table 2, but would provide an 85% payback on the Double Ended MCC with VFDs at an estimated cost of \$310,000.

If you have any questions or require additional information, please contact me at 616-464-3848 or ccirving@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.



Cynthia C. Irving, P.E.

nes

By e-mail

cc: Mr. Breese Stam, P.E. – City of Grand Rapids, Michigan
Mr. Chuck Henderson – City of Grand Rapids
Mr. Scott Hayden – City of Grand Rapids
Mr. David P. Bratt, P.E. – FTC&H
Mr. David L. Conklin, P.E. – FTC&H

June 13, 2011
Project No. G110386

Ms. Izabel Hartman
Project Manager
RLS/Resource Management Division
Dept. of Environmental Quality
Constitution Hall - 3rd Floor South
525 West Allegan
Lansing, MI 48933

Re: Grand Rapids Drinking Water Revolving Fund (DWRP) Fiscal Year (FY) 2012
Green Project Reserve Letter Follow-up

Dear Ms. Hartman:

This letter is in response to your May 24, 2011 e-mail response to our May 20, 2011 Green Project Reserve (GPR) letter for DWRP projects scheduled for FY 2012. Additional information was requested for the East Paris Service Center (EPSC) Expansion including the motor efficiency of the pumps, the estimated cost for the variable frequency drives (VFDs) and pumps, and payback calculations for the GPR portion of the project.

Motor Efficiency of Pumps

The proposed pumps at the East Paris Service Center would be specified with NEMA Premium Efficiency Motors. The NEMA standard for an enclosed 350 horsepower (HP) premium efficiency motor is 95.8%. The existing motors, when new in 1979, were rated at an efficiency of 94%. Large motors have historically been efficient due to the large amount of copper in their windings. As discussed in our May 20, 2011, GPR letter, a 1.8% increase in efficiency on the 350 HP motor (assuming an increase in energy costs of 3% per year) yields a 20-year present worth cost of \$46,500. While the increase in efficiency is limited due to the historic selection of energy efficient equipment, the new pumps will improve upon the existing pump efficiency.

VFD and Pump Cost Estimate

Our May 20, 2011 letter summarized the energy and cost savings realized by the EPSC Expansion. Installation of the new pumps and VFDs saved 163,000 kilowatt hours (KWh) of electricity annually, which is 8.4% of the total energy used currently at the EPSC. The energy savings is primarily due to the elimination of the bleed-back valve on the discharge side of the pumps. Instead of recirculating water, the VFDs can be used to operate the pumps at a lower speed and hence lower pressure. Effective operation of the VFDs will require pressure data that will be tied into the Supervisory Control and Data Acquisition (SCADA) system for either automatic speed control or feedback to the operators who can control the pump speed settings. Flow monitoring in addition to pressure readings will provide the data needed to operate the pumps near their best efficiency point (BEP) and the data needed to monitor wear on the pumps to assist in operation and maintenance.

The May 24, 2011 e-mail requested that the GPR portion of the cost estimate in the Project Plan be provided along with a payback calculation. Dividing out the GPR portion of the project was difficult due to the interrelated nature of the project. Table 1 presents the cost estimate presented in the Project Plan. Other than the Miscellaneous Building Improvements, all of the project elements are needed for proper installation and operation of the new pumps.

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architects
constructors

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Table 1 - Original EPSC Cost Estimate from DWRP Project Plan

	Estimated Capital Cost	Design Life (yrs)	Replacement Cost	Salvage Value
Building Expansion	\$800,000	50	\$0	\$480,000
Process Pipe and Valves	\$450,000	50	\$0	\$270,000
Sitework and Piping	\$100,000	50	\$0	\$60,000
Pumps and Motors	\$360,000	20	\$0	\$0
Variable Frequency Drives	\$200,000	20	\$0	\$0
Instrumentation	\$175,000	20	\$0	\$0
Electrical	\$450,000	20	\$0	\$0
Miscellaneous Building Improvements	\$150,000	50	\$0	\$90,000
Subtotal - Estimated Construction Cost	\$2,690,000		\$0	\$900,000
Contingency (20%)	\$540,000			
Engineering (20%)	\$540,000			
Total - Estimated Project Budget	\$3,770,000			

Therefore, the GPR portion of the project focused on the VFDs and the new pumps and those components most closely related to their installation and operation. Table 2 presents the more detailed GPR cost estimate. The project includes VFDs for all four pumps with a material cost of \$200,000 (four VFDs at \$50,000 each). The VFDs will be installed in a motor control center. The instrumentation is needed to properly operate the pumps including integration of the necessary pressure and flow data. The electrical is a critical component of the VFD and pump installation. The pumps have a material cost of \$180,000 (two pumps at \$90,000 each). Installation of the pumps is also included.

Table 2 - Green Project Portion for EPSC

	Estimated Capital Cost	Design Life (yrs)	Replacement Cost	Salvage Value
Double Ended Motor Control Center with VFDs	\$310,000	20	\$0	\$0
Instrumentation	\$175,000	20	\$0	\$0
Electrical to Pumps and MCC	\$80,000	20	\$0	\$0
Pumps	\$180,000	20	\$0	\$0
Installation of Pumps	\$55,000	20	\$0	\$0
Subtotal	\$800,000		\$0	\$0
Contingency (20%)	\$160,000			
Construction Engineering Cost (10%)	\$80,000			
Total Construction Cost	\$1,040,000			
Design Engineering (10%)	\$80,000			
Total Estimated Project Budget	\$1,120,000			

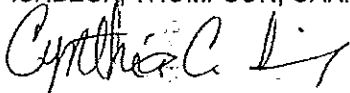
Ms. Izabel Hartman
Page 3
June 13, 2011

All of the components listed in Table 2 have a twenty year design life. The twenty year present worth analysis determined that the project would result in a \$262,000 savings. Evaluating a payback on capital and operation costs, the savings do not cover all of the costs listed in Table 2, but would provide an 85% payback on the Double Ended MCC with VFDs at an estimated cost of \$310,000.

If you have any questions or require additional information, please contact me at 616-464-3848 or ccirving@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.



Cynthia C. Irving, P.E.

nes

By e-mail

cc: Mr. Breese Stam, P.E. – City of Grand Rapids, Michigan

May 20, 2011
Project No. G110386

Izabel Hartman
Project Manager
RLS/Resource Management Division
Dept. of Environmental Quality
Constitution Hall - 3rd Floor South
525 West Allegan
Lansing, MI 48933

Re: Grand Rapids Drinking Water Revolving Fund (DWRf) Fiscal Year (FY) 2012
Green Project Reserve Letter

Dear Ms. Hartman:

This letter is in response to your request for Green Project Reserve letters for DWRf projects scheduled for FY 2012. The City of Grand Rapids has four scheduled projects for FY 2012 of which two have been identified as green projects: the East Paris Service Center (EPSC) Expansion and the Southeast Tank Water Main. The green projects are discussed individually in this letter.

EPSC Expansion

The EPSC is located on the east side of the East High Pressure District. As discussed in the DWRf project plan, there are currently two 350 horsepower (HP), 7 million gallons per day (mgd) pumps at the EPSC discharging at 160 to 175 feet of head. During maximum day demand, both pumps are operated and the 20-year demand projections will require three pumps operating on maximum day demand. Therefore, for reliability there must be four pumps at the EPSC so that the maximum day demand can be supplied with the largest pump out of service (firm capacity design). Therefore, installation of two new 7 mgd pumps was identified in the DWRf Project Plan for reliability and redundancy.

The design of the EPSC Expansion, will also be a green project due to the installation of new pumps with Variable Frequency Drives (VFDs) that will eliminate the use of a bleed back valve needed to control pressures. Currently, when both pumps are operated, the distribution system is over-pressurized exceeding 95 pounds per square inch (psi). To prevent an over-pressure there is a 6-inch pressure reducing valve that opens when the discharge header exceeds 90 psi and re-circulates water to the suction header supplying the pumps. System operators indicate that on days exceeding an average of 60 mgd across the system, two pumps must be operated to maintain the desired pressure in the system. Hydraulic modeling confirmed the need for two pumps at total system demands of 60 mgd up to and including 85 mgd.

Ten years of daily water production data from January 1, 1999, to August 31, 2009, were analyzed. Twelve percent of the production days (41 days per year) fell within the 60 to 85 mgd range. From the hydraulic model, with a total system demand of 60 mgd, 3,500 gallons per minute (gpm) of water are re-circulated through the bleed back valve. At 85 mgd, 1,000 gpm are re-circulated with a linear correlation between the total system demand and volume of water re-circulated. Water billing records were reviewed from June 2010 through May 2011, the cost for energy averaged \$0.095 per kilowatt hour (KWh), and the monthly energy use averaged 162,600 KWh.

Taking the volume of water re-circulated, the 90 psi discharge pressure (14.5 psi suction), the historic days per year operated, and an energy cost of \$0.095/KWh, the energy and economic cost of re-circulating water at the EPSC is 134,200 KWh of electricity at an annual cost of \$12,750. For comparison, the energy usage billed in January 2011 was 135,631 KWh. A 20-year present worth analysis on the \$12,750 energy cost of re-circulating the water,

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Ms. Izabel Hartman

Page 2

May 20, 2011

assuming a discount rate of 4.375% and no annual increase in energy cost results in a total 20-year present worth of \$167,650. Assuming that energy costs increase by 3% per year, yields a 20-year present worth of \$215,500.

The existing pumps have a rated pump efficiency of 85% and a motor efficiency of 94%. The new pumps would have a rated pump efficiency of 85% and a motor efficiency of 95.8%, making the new pumps 1.8% more efficient resulting in an energy savings of 29,000 KWh per year (\$2,755 per year). Assuming an increase in energy costs of 3% per year yields a 20-year present worth of \$46,500.

The total energy use for the EPSC from June 2010 through May 2011 was 1,951,302 KWh at a total cost of \$185,125. Providing the new EPSC pumps with VFDs and a more energy efficient motor will save 163,000 KWh of electricity at a current annual cost of \$15,505. This is an energy and cost savings of 8.4%, with a 20-year present worth assuming a 3% increase in energy cost of \$262,000. The energy savings over a 20-year period is substantial, due to the large volume of water pumped at the EPSC.

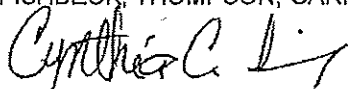
Southeast Tank Water Main

As discussed in section 3.2.2.2 of the DWRP Project Plan, to fill the Southeast Elevated Storage Tank (Patterson Tank), either a 16-inch water main or an additional pump at the EPSC would be needed. The cost-benefit analysis demonstrated that the additional pump design would have an energy cost of \$10,000 per year with a 20-year present worth cost of \$133,000 (without inflation of energy costs). An additional 119,000 KWh would be necessary to fill the Patterson Tank on a yearly basis with a pump as opposed to a water main. The Southeast Tank Water Main is an energy efficiency project that "cost effectively eliminates a pump."

If you have any questions or require additional information, please contact me at 616-464-3848 or ccirving@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.



Cynthia C. Irving, P.E.

agd

By e-mail and Fed Ex Ground

cc: Mr. Breese Stam, P.E. – City of Grand Rapids, Michigan